RATIONAL IMAGING

A painful hip

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BMJ 2007;335:563-4
doi:10.1136/bmj.39239.420220.8

If you suspect a patient has a fractured hip but radiographs are normal, how else can you confirm this diagnosis?

The patient

A previously fit and well 86 year old man presented with acute pain in the left hip after a fall. He had no medical history of note. Hip movement was painful on examination, but no deformity or diagnostic features were present. No fractures were seen on anteroposterior and lateral radiographs of the hip (fig 1).

What test do I order?

Only 1% of all fractured necks of femur are radiographically occult,[1] but this figure is higher in selected study groups.[2 3] Patients have undisplaced fractures at presentation, and they can be identified with a variety of approaches.

Repeat radiographs

Repeat radiographs are indicated if initial radiographs were inadequate or if a time delay has occurred between initial presentation and the decision to image further. Radiographs should be centred on the affected hip with a true lateral obtained if no fracture is seen on the anteroposterior view. If no fracture is seen on either of these views then an internal rotation film or angled view of the hip can be performed.[4] In cases where an inadvertent delay has occurred, the working diagnosis has usually been a soft tissue injury but the patient has failed to mobilise as expected. A time delay of several days allows resorption to occur around the fracture site or cortical displacement to occur, which renders the fracture radiographically visible.

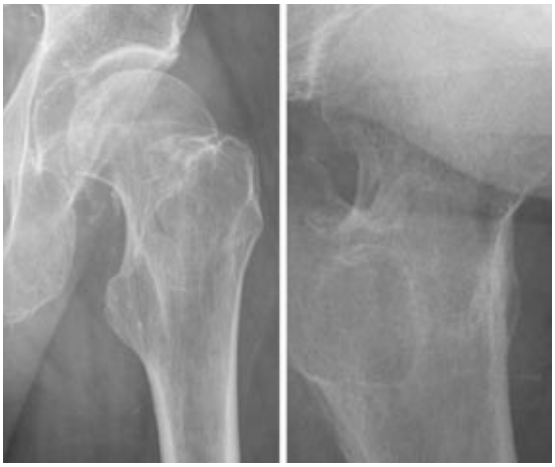

Fig 1 | Anteroposterior (left) and lateral (right) radiographs of the left hip; no fracture is visible

LEARNING POINTS

- Whenever fractured neck of the femur is suspected on clinical grounds, the patient should be treated for fracture until proved otherwise
- Normal radiographs (with additional views as appropriate) do not exclude femoral neck fracture—occult fractures comprise about 1% of all fractured necks of femur
- Before proceeding to further imaging the adequacy of the initial radiographic views must be assessed
- Magnetic resonance imaging is the method of choice in this situation—it can diagnose occult hip fracture quickly, reliably, and cost effectively
- Where there is delay in diagnosis or contraindication to magnetic resonance imaging, repeat radiography or scintigraphy may be useful

Bone scintigraphy

Bone scintigraphy assesses increased bone turnover at the fracture site. Results of this test are positive 24 hours after fracture in young adults but may take up to 72 hours in older patients.[5-8] The time difference is caused by variations in vascularity and bone turnover in younger and older patients. This test is particularly useful if provision of magnetic resonance imaging is poor or if patients should not undergo magnetic resonance imaging. Scintigraphy is an excellent excluder of bone injury but positive findings are non-specific. Various pathologies, such as arthropathy or tumour, can produce focally increased activity in the proximal femur that can mimic fracture.[9]

Ultrasound

Ultrasound is useful for showing soft tissue changes and also provides a limited view of bone surface in patients who have undergone trauma.[10] The hip is the deepest joint in the body, however, so sonography is not usually valuable for assessing bone surface change at this site. Irregularity of the bone surface is common in elderly patients, which further reduces the usefulness of ultrasound in diagnosing fractures. It can show effusion or haemorrhage in the joints of patients with hip fractures, but it rarely directly visualises fractures.

This series provides an update on the best use of different imaging methods for common or important clinical presentations. The series editors are Fergus Gleeson, consultant radiologist, Churchill Hospital, Oxford, and Kamini Patel, consultant radiologist, Homerton Hospital, London

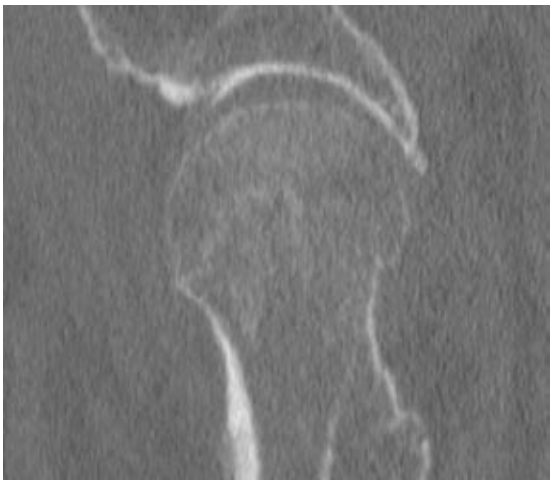

Fig 2 | Reformatted computed tomogram of left femoral neck showing no visible fracture

Ultrasound findings are non-specific so this technique has a limited role in hip trauma.

Computed tomography

Computed tomography can be used to diagnose hip fractures. Studies that detail hip fractures tend to look at acetabular fractures and few data are available for femoral neck fractures.[11] This is probably because patients with femoral neck fractures often have osteoporosis with little fracture displacement. This makes computed tomography less reliable for demonstrating fractures in the femoral neck than in other areas of the body (fig 2).

Magnetic resonance imaging

Fracture detection using magnetic resonance imaging relies less on showing cortical or trabecular discontinuity than radiography or computed tomography. The presence of oedema around fracture sites helps delineate the fracture margins. In most patients limited sequencing means the imaging can be completed within 15 minutes.

This technique has good sensitivity and specificity for femoral neck fractures and also shows soft tissue injuries that are often present in isolation or associated with such fractures.[2 3 12] Early magnetic resonance imaging is more cost effective than other diagnostic strategies.[13] It has 100% accuracy[14]; scintigraphy is slightly less accurate, with a sensitivity of 93% and specificity of 95%.[7]

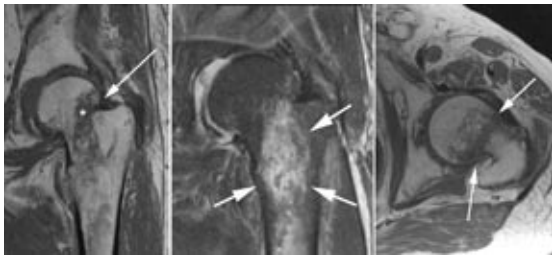

Fig 3 | Left: coronal T1 weighted magnetic resonance imaging of left hip showing an impacted fracture of the superior femoral neck (arrow) with extensive oedema extending into the femoral neck down to the level of the lesser trochanter (asterisk). Middle: coronal STIR magnetic resonance imaging of left hip showing extensive oedema in the femoral neck extending down to the proximal femoral metaphysis (arrows). The fracture line is less clearly seen than in T1 weighted images. Right: axial T1 weighted image showing fracture line extending across the femoral neck (arrows)

Outcome

Magnetic resonance imaging confirmed the presence of a complete fracture of the femoral neck. This was confirmed at surgery and treated successfully (fig 3).

Contributors: PJO'C is guarantor.
Funding: None.
Competing interests: None declared.
Provenance and peer review: Commissioned; externally peer reviewed.

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Endpiece

The whole

The cure of many diseases is unknown to the physicians of Hellas, because they are ignorant of the whole, which ought to be studied also; for the part can never be well unless the whole is well . . . this is the great error of our day in the treatment of the human body, that the physicians separate the soul from the body.

Plato (Greek philosopher, c427–347 BC)

Submitted by Nageena Hussain, senior house officer in anaesthetics, Heart of England NHS Trust